

Amendment to the claims

1. (Thrice Amended). An article of manufacture comprising a substantially transparent three dimensional substrate non-uniform in each orthogonal dimension and being of a size and shape suitable for use as [a decorative] an ornamental object [gemstones and ornaments] and a multilayer thin film interference coating over substantially the entire surface of said substrate, said coating consisting of alternating layers of substantially nonabsorbing materials with a relatively high refractive index and a relatively low refractive index with respect to each other, the thicknesses and identities of said layers being chosen so that the entire coating will preferentially reflect at least some of the incident light with wavelengths between 400 nm and 700 nm inclusive.

13. (Thrice Amended). An article of manufacture comprising:
a substantially transparent, three dimensional, non-uniform dimension in any orthogonal direction, substrate having at least one curved surface and at least two maximum dimensions substantially the same; and
a multilayer thin film interference coating over substantially the entire surface of said substrate, said coating consisting of alternating layers of substantially nonabsorbing materials with a relatively high refractive index and a relatively low refractive index with respect to each other, the thicknesses and identities of said layers being chosen so that the entire coating will preferentially reflect and transmit at least some of the incident light within predetermined wavelength bands.

14. The article of Claim 13 wherein the entire coating preferentially transmits at least some of the incident light above a predetermined wavelength.

15. The article of Claim 13 wherein the entire coating preferentially transmits at least some of the incident light below a predetermined wavelength.

16. The article of Claim 13 having a size and shape suitable for use as a decorative object selected from the group consisting of gemstones and ornaments.

17. (Thrice Amended). An article of manufacture comprising:
a three dimensional substrate having maximum height, width, and depth
dimensions substantially the same formed from a substantially transparent material; and
a substantially uniform multilayer thin film interference coating over substantially
the entire surface of said substrate, said coating comprising alternating layers of materials
having different refractive indices to thereby form a coating which is substantially
transmissive of incident light at predetermined wavelengths.

18. The article of Claim 17 wherein the coating is substantially transmissive of incident light above a predetermined wavelength.

19. The article of Claim 17 wherein the coating is substantially transmissive of incident light below a predetermined wavelength.

20. The article of Claim 17 wherein the coating is substantially transmissive of incident light within a predetermined wavelength band.

21. The article of Claim 17 having a size and shape suitable for use as a decorative object selected from the group consisting of gemstones and ornaments.

22. (Thrice Amended). A uniformly coated three dimensional object comprising:

a substrate having a maximum depth dimension substantially the same as both its height and width dimensions and being formed from a substantially transparent material; and

a coating over substantially the entire surface of said substrate, said coating comprising alternating layers of materials having relatively high and relatively low reflective indices relative to each other and being substantially uniform and over substantially the entire surface of said substrate.

23. The object of Claim 22 wherein said coating controls the transmission of incident light at predetermined wavelengths.

24. The object of Claim 22 wherein said coating controls the absorption of incident light at predetermined wavelengths.

25. The object of Claim 22 wherein said coating controls the reflection of incident light at predetermined wavelengths.

26. The article of Claim 22 having a size and shape suitable for use as a decorative object selected from the group consisting of gemstones and ornaments.

27. (Twice Amended). A decorative object comprising:
a substantially transparent, three dimensional substrate having at least two non-parallel curved surfaces; and

a coating uniformly covering substantially the entire surface of the substrate, said coating comprising alternating layers of materials having differing refractive indices to thereby substantially transmit all of the incident light at predetermined wavelengths.

28. (Thrice Amended). A method of making a uniformly coated three dimensional object, said method comprising the steps of:

(a) providing a substantially transparent, three dimensional substrate having no parallel surfaces and substantially the same maximum height, width, and depth dimensions; and

(b) depositing a coating over substantially the entire surface of the substrate, the coating comprising alternating layers of materials having different indices of refraction so that the coating is substantially transmissive of light at predetermined wavelengths.

29. The method of Claim 28 wherein the coating is deposited by low pressure chemical vapor deposition.

30. The method of Claim 28 wherein the object has a size and shape suitable for use as a decorative object selected from the group consisting of gemstones and ornaments.

31. The method of Claim 28 wherein the coating is substantially transmissive of incident light above a predetermined wavelength.

32. The method of Claim 28 wherein the coating is substantially transmissive of incident light below a predetermined wavelength.

33. The method of Claim 28 wherein the coating is substantially transmissive of incident light within a predetermined wavelength band.

34. The method of Claim 28 wherein the substrate has a size and shape suitable for use as a decorative object selected from the group consisting of gemstones and ornaments.

35. (Thrice Amended). A method of making a uniformly coated object substantially transmissive of light at predetermined wavelengths comprising the steps of:

(a) providing a substantially transparent, three dimensional substrate having at least one curved surface, at least two maximum dimensions substantially the same, and no substantially parallel surfaces; and

(b) depositing a coating over substantially the entire surface of the substrate, the coating comprising alternating layers of materials having different indices of refraction so that the coating is substantially transmissive of light at predetermined wavelengths.

36. The method of Claim 35 wherein the coating is deposited by low pressure chemical vapor deposition.

37. The method of Claim 35 wherein the coating is substantially transmissive of incident light above a predetermined wavelength.

38. The method of Claim 35 wherein the coating is substantially transmissive of incident light below a predetermined wavelength.

39. The method of Claim 35 wherein the coating is substantially transmissive of incident light within a predetermined wavelength band.

40. (Amended) An article of manufacture comprising:
a substantially transparent substrate having a desired three dimensional shape with
at least one curved surface, substantially the same maximum dimension in at least two
orthogonal directions and no parallel surfaces; and
a multilayer thin film interference coating covering over substantially the entire
surface of said substrate,
said coating comprising alternating layers of substantially non-absorbing materials
(a) where the materials in said alternating layers have materially different refractive
indices with respect to each other and (b) where the thicknesses of said alternating layers
and the identities of the materials are such that said coating will preferentially reflect at
least some of the incident light with wavelengths between 400 nm and 700 nm inclusive.

41. The article of Claim 40 in which said substrate is selected from the group
consisting of silicon dioxide, aluminum oxide, tantalum oxide, niobium oxide, titanium
dioxide, hafnium dioxide, zirconium dioxide, magnesium fluoride, calcium fluoride, zinc
sulfide, zinc selenide and carbon.

42. The article of Claim 40 in which the substrate is comprised of a polymeric
material and said alternating layers are comprised of metal oxides.

43. The article of Claim 40 wherein said coating is substantially transmissive of
incident light within a predetermined band of wavelengths.

44. (Amended) An article of manufacture comprising:

a substantially transparent substrate having a desired three dimensional shape with substantially the same maximum dimension in three orthogonal directions, at least one generally circular cross-section, and no parallel surfaces; and

a multilayer thin film interference coating covering over substantially the entire surface of said substrate,

said coating comprising alternating layers of substantially non-absorbing materials

(a) where the materials in said alternating layers have materially different refractive indices with respect to each other and (b) where the thicknesses of said alternating layers and the identities of the materials are such that said coating will preferentially reflect at least some of the incident light with wavelengths between 400 nm and 700 nm inclusive.

45. (Twice amended). A method of making an article of manufacture comprising the steps of:

(a) providing a substantially transparent, three dimensional substrate having at least one curved surface and substantially the same maximum dimensions in at least two orthogonal directions; and

(b) depositing a multilayer thin film interference coating on substantially the entire surface of the substrate,

said coating comprising alternating layers of substantially nonabsorbing materials

(i) where the alternating layers have materially different refractive indices with respect to each other and (ii) where the thicknesses of the alternating layers and the identities of the

materials are such that the coating will preferentially reflect at least some of the incident light with wavelengths between 400 nm and 700 nm inclusive.

46. (Amended) The article of Claim 44 wherein the substrate is comprised of a polymeric material and the materials in the alternating layers are metal oxides.

Please cancel claim 47.

47. (Cancelled).

48. (Twice amended). A method of making an article of manufacture comprising the steps of:

(a) providing a substantially transparent, three dimensional substrate having substantially the same maximum dimensions in at least two orthogonal directions and at least one generally circular cross-section; and

(b) depositing a multilayer thin film interference coating on substantially the entire surface of the substrate by a chemical vapor depositing process,

said coating comprising alternating layers of substantially nonabsorbing materials (i) where the alternating layers have materially different refractive indices with respect to each other and (ii) where the thicknesses of the alternating layers and the identities of the materials are such that the coating will preferentially reflect at least some of the incident light with wavelengths between 400 nm and 700 nm inclusive.

49. A method of making an article of manufacture comprising the steps of:

(a) providing a substantially transparent, three dimensional substrate having at least one curved surface and at least one generally circular cross-section; and

(b) depositing a multilayer thin film interference coating on substantially the entire surface of the substrate,

said coating comprising alternating layers of substantially nonabsorbing materials
(i) where the alternating layers have materially different refractive indices with respect to each other and (ii) where the thicknesses of the alternating layers and the identities of the materials are such that the coating will preferentially reflect at least some of the incident light with wavelengths between 400 nm and 700 nm inclusive.

50. A method of making an article of manufacture comprising the steps of:

(a) providing a substantially transparent, three dimensional substrate non-uniform in any orthogonal dimension and having at least one curved surface and at least one generally circular cross-section; and

(b) depositing a multilayer thin film interference coating on substantially the entire surface of the substrate,

said coating comprising alternating layers of substantially nonabsorbing materials
(i) where the alternating layers have materially different refractive indices with respect to each other and (ii) where the thicknesses of the alternating layers and the identities of the materials are such that the coating will preferentially reflect at least some of the incident light with wavelengths between 400 nm and 700 nm inclusive.

51. An article of manufacture comprising a substantially transparent substrate having a desired three dimensional shape; and

a multilayer thin film interference coating covering over substantially the entire surface of said substrate, said coating comprising alternating layers of substantially non-

absorbing materials (a) where the materials in said alternating layers have materially different refractive indices with respect to each other and (b) where the thicknesses of said alternating layers and the identities of the materials are such that said coating will preferentially reflect at least some of the incident light with wavelengths between 400 nm and 700 nm inclusive,

said substrate being non-uniform in any orthogonal dimension and having no parallel surfaces.

52. The article of Claim 51 wherein said coating is substantially transmissive of incident light within a predetermined band of wavelengths; and

wherein said substrate is generally circular in at least one cross-section.

53. The article of Claim 51 wherein said coating is substantially transmissive of incident light within a predetermined band of wavelengths; and

wherein the maximum dimension of said substrate is substantially the same in three orthogonal dimensions.

54. The article of Claim 53 wherein said substrate has plural generally circular cross-sections in parallel planes.

1. (Thrice Amended). An article of manufacture comprising a substantially transparent three dimensional substrate non-uniform in each orthogonal dimension and being of a size and shape suitable for use as [a decorative] an ornamental object [gemstones and ornaments] and a multilayer thin film interference coating over substantially the entire surface of said substrate, said coating consisting of alternating layers of substantially nonabsorbing materials with a relatively high refractive index and a relatively low refractive index with respect to each other, the thicknesses and identities of said layers being chosen so that the entire coating will preferentially reflect at least some of the incident light with wavelengths between 400 nm and 700 nm inclusive.

13. (Thrice Amended). An article of manufacture comprising:
a substantially transparent, three dimensional, non-uniform dimension in any orthogonal direction, substrate having at least one curved surface and at least two maximum dimensions substantially the same; and

a multilayer thin film interference coating over substantially the entire surface of said substrate, said coating consisting of alternating layers of substantially nonabsorbing materials with a relatively high refractive index and a relatively low refractive index with respect to each other, the thicknesses and identities of said layers being chosen so that the entire coating will preferentially reflect and transmit at least some of the incident light within predetermined wavelength bands.

14. The article of Claim 13 wherein the entire coating preferentially transmits at least some of the incident light above a predetermined wavelength.

15. The article of Claim 13 wherein the entire coating preferentially transmits at least some of the incident light below a predetermined wavelength.

16. The article of Claim 13 having a size and shape suitable for use as a decorative object selected from the group consisting of gemstones and ornaments.

17. (Thrice Amended). An article of manufacture comprising:
a [non-planar] three dimensional substrate having maximum height, width, and depth dimensions substantially the same formed from a substantially transparent material;
and

a substantially uniform multilayer thin film interference coating over substantially the entire surface of said [non-planar] substrate, said coating comprising alternating layers of materials having different refractive indices to thereby form a coating which is substantially transmissive of incident light at predetermined wavelengths.

18. The article of Claim 17 wherein the coating is substantially transmissive of incident light above a predetermined wavelength.

19. The article of Claim 17 wherein the coating is substantially transmissive of incident light below a predetermined wavelength.

20. The article of Claim 17 wherein the coating is substantially transmissive of incident light within a predetermined wavelength band.

21. The article of Claim 17 having a size and shape suitable for use as a decorative object selected from the group consisting of gemstones and ornaments.

22. (Thrice Amended). A uniformly coated [complex shaped] three dimensional object comprising:

a [complex shaped] substrate having a maximum depth dimension substantially the same as both its height and width dimensions and being formed from a substantially transparent material; and

a coating over substantially the entire surface [thereof] of said substrate, said coating comprising alternating layers of materials having relatively high and relatively low reflective indices relative to each other and being substantially uniform and over substantially the entire surface of said substrate.

23. The object of Claim 22 wherein said coating controls the transmission of incident light at predetermined wavelengths.

24. The object of Claim 22 wherein said coating controls the absorption of incident light at predetermined wavelengths.

25. The object of Claim 22 wherein said coating controls the reflection of incident light at predetermined wavelengths.

26. The article of Claim 22 having a size and shape suitable for use as a decorative object selected from the group consisting of gemstones and ornaments.

27. (Twice Amended). A decorative object comprising:
a substantially transparent, three dimensional substrate having at least two non-parallel curved surfaces; and

a coating uniformly covering substantially the entire surface of the substrate, said coating comprising alternating layers of materials having differing refractive indices to thereby substantially transmit all of the incident light at predetermined wavelengths.

28. (Thrice Amended). A method of making a uniformly coated three dimensional object [having a complex shape], said method comprising the steps of:

(a) providing a substantially transparent, three dimensional substrate having [a complex shape] no parallel surfaces and substantially the same maximum height, width, and depth dimensions; and

(b) depositing a coating over substantially the entire surface of the [complex shaped] substrate, the coating comprising alternating layers of materials having different indices of refraction so that the coating is substantially transmissive of light at predetermined wavelengths.

29. The method of Claim 28 wherein the coating is deposited by low pressure chemical vapor deposition.

30. The method of Claim 28 wherein the object has a size and shape suitable for use as a decorative object selected from the group consisting of gemstones and ornaments.

31. The method of Claim 28 wherein the coating is substantially transmissive of incident light above a predetermined wavelength.

32. The method of Claim 28 wherein the coating is substantially transmissive of incident light below a predetermined wavelength.

33. The method of Claim 28 wherein the coating is substantially transmissive of incident light within a predetermined wavelength band.

34. The method of Claim 28 wherein the substrate has a size and shape suitable for use as a decorative object selected from the group consisting of gemstones and ornaments.

35. (Thrice Amended). A method of making a uniformly coated object [having at least two planar surfaces, said method] substantially transmissive of light at predetermined wavelengths comprising the steps of:

(a) providing a substantially transparent, three dimensional substrate having at least [two planar surfaces] one curved surface, at least two maximum dimensions substantially the same, and no substantially parallel surfaces; and

(b) depositing a coating over substantially the entire surface of the [planar shaped] substrate, the coating comprising alternating layers of materials having different indices of refraction so that the coating is substantially transmissive of light at predetermined wavelengths.

36. The method of Claim 35 wherein the coating is deposited by low pressure chemical vapor deposition.

37. The method of Claim 35 wherein the coating is substantially transmissive of incident light above a predetermined wavelength.

38. The method of Claim 35 wherein the coating is substantially transmissive of incident light below a predetermined wavelength.

39. The method of Claim 35 wherein the coating is substantially transmissive of incident light within a predetermined wavelength band.

40. (Amended) An article of manufacture comprising:
a substantially transparent substrate having a desired three dimensional shape with at least one curved surface, [and] substantially the same maximum dimension in at least two orthogonal directions and no parallel surfaces; and
a multilayer thin film interference coating covering over substantially the entire surface of said substrate,
said coating comprising alternating layers of substantially non-absorbing materials
(a) where the materials in said alternating layers have materially different refractive indices with respect to each other and (b) where the thicknesses of said alternating layers and the identities of the materials are such that said coating will preferentially reflect at least some of the incident light with wavelengths between 400 nm and 700 nm inclusive.

41. The article of Claim 40 in which said substrate is selected from the group consisting of silicon dioxide, aluminum oxide, tantalum oxide, niobium oxide, titanium dioxide, hafnium dioxide, zirconium dioxide, magnesium fluoride, calcium fluoride, zinc sulfide, zinc selenide and carbon.

42. The article of Claim 40 in which the substrate is comprised of a polymeric material and said alternating layers are comprised of metal oxides.

43. The article of Claim 40 wherein said coating is substantially transmissive of incident light within a predetermined band of wavelengths.

44. (Amended) An article of manufacture comprising:

a substantially transparent substrate having a desired three dimensional shape with substantially the same maximum dimension in three orthogonal directions, [and] at least one generally circular cross-section, and no parallel surfaces; and

a multilayer thin film interference coating covering over substantially the entire surface of said substrate,

said coating comprising alternating layers of substantially non-absorbing materials (a) where the materials in said alternating layers have materially different refractive indices with respect to each other and (b) where the thicknesses of said alternating layers and the identities of the materials are such that said coating will preferentially reflect at least some of the incident light with wavelengths between 400 nm and 700 nm inclusive.

45. (Twice amended). A method of making an article of manufacture comprising the steps of:

(a) providing a substantially transparent, three dimensional substrate having at least one curved surface and substantially the same maximum dimensions in at least two orthogonal directions; and

(b) depositing a multilayer thin film interference coating on substantially the entire surface of the substrate,

said coating comprising alternating layers of substantially nonabsorbing materials (i) where the alternating layers have materially different refractive indices with respect to each other and (ii) where the thicknesses of the alternating layers and the identities of the

materials are such that the coating will preferentially reflect at least some of the incident light with wavelengths between 400 nm and 700 nm inclusive.

46. (Amended) The article [method] of Claim 44 wherein the substrate is comprised of a polymeric material and the materials in the alternating layers are metal oxides.

47. (Cancelled).

48. (Twice amended). A method of making an article of manufacture comprising the steps of:

(a) providing a substantially transparent, three dimensional substrate having substantially the same maximum dimensions in at least two orthogonal directions and at least one generally circular cross-section; and

(b) depositing a multilayer thin film interference coating on substantially the entire surface of the substrate by a chemical vapor depositing process,

said coating comprising alternating layers of substantially nonabsorbing materials (i) where the alternating layers have materially different refractive indices with respect to each other and (ii) where the thicknesses of the alternating layers and the identities of the materials are such that the coating will preferentially reflect at least some of the incident light with wavelengths between 400 nm and 700 nm inclusive.

49. A method of making an article of manufacture comprising the steps of:

(a) providing a substantially transparent, three dimensional substrate having at least one curved surface and at least one generally circular cross-section; and

(b) depositing a multilayer thin film interference coating on substantially the entire surface of the substrate,

said coating comprising alternating layers of substantially nonabsorbing materials (i) where the alternating layers have materially different refractive indices with respect to each other and (ii) where the thicknesses of the alternating layers and the identities of the materials are such that the coating will preferentially reflect at least some of the incident light with wavelengths between 400 nm and 700 nm inclusive.

50. A method of making an article of manufacture comprising the steps of:

(a) providing a substantially transparent, three dimensional substrate non-uniform in any orthogonal dimension and having at least one curved surface and at least one generally circular cross-section; and

(b) depositing a multilayer thin film interference coating on substantially the entire surface of the substrate,

said coating comprising alternating layers of substantially nonabsorbing materials (i) where the alternating layers have materially different refractive indices with respect to each other and (ii) where the thicknesses of the alternating layers and the identities of the materials are such that the coating will preferentially reflect at least some of the incident light with wavelengths between 400 nm and 700 nm inclusive.

51. An article of manufacture comprising a substantially transparent substrate having a desired three dimensional shape; and

a multilayer thin film interference coating covering over substantially the entire surface of said substrate, said coating comprising alternating layers of substantially non-

absorbing materials (a) where the materials in said alternating layers have materially different refractive indices with respect to each other and (b) where the thicknesses of said alternating layers and the identities of the materials are such that said coating will preferentially reflect at least some of the incident light with wavelengths between 400 nm and 700 nm inclusive,

said substrate being non-uniform in any orthogonal dimension and having no parallel surfaces.

52. The article of Claim 51 wherein said coating is substantially transmissive of incident light within a predetermined band of wavelengths; and

wherein said substrate is generally circular in at least one cross-section.

53. The article of Claim 51 wherein said coating is substantially transmissive of incident light within a predetermined band of wavelengths; and

wherein the maximum dimension of said substrate is substantially the same in three orthogonal dimensions.

54. The article of Claim 53 wherein said substrate has plural generally circular cross-sections in parallel planes.

Status Of Claims And Support For Claim Changes

Claims 1-12 are derived from the claims issued in U.S. Patent No. 6,197,428.

Claims 13-48 were previously added and Claims 49- 54 are newly added. Claim 47 has been cancelled. Claims 1-46 and 48-54 are now pending.

The amendments made in this response are shown beginning on sheet 2 of this Amendment.

The claims are all directed to a substantially transparent, three dimensional substrate. Various limitations as to the substrate have been added in various combinations. The support for these limitations may be found in Figure 1 and the turtle shape disclosed at column 5, line 46. Further support for all pending claims can be found in the specification and other remarks, for example, pages 6-9 of the Amendment filed April 19, 2004.

More specifically, the non-uniformity of the dimension of the substrate in any of the three orthogonal directions is shown in both Figure 1 and the turtle shape.

The curvature of at least one surface of the substrate (e.g. Independent Claims 13, 35, 40, 44 and 45) is disclosed in the turtle shape.

The substantial equality of the maximum dimensions in at least two of the orthogonal directions (e.g., independent Claims 13, 22, 35, 40, 44, 45 and 48) is shown in Figure 1 and the turtle shape.

The substantial equality of the maximum dimensions of the substrate in at all three of the orthogonal directions (e.g. independent Claims 13, 28 and 41) is shown in Figure 1.

The non-parallelism of the two major surfaces of the substrate (e.g., independent Claims 22, 40, 41 and 51), is shown in Figure 1 and in the turtle shape.

The generally circular cross-section of the substrate (e.g., independent Claims 44, 41 and 48) is shown in Figure 1, specifically in the horizontal cross-section taken at the maximum horizontal dimension of the substrate.

No new matter has been added